

Interview with Dr. Starnes Walker ONR Technical Director and Chief Scientist



Dr. Starnes Walker

Dr. Starnes E. Walker joined the Office of Naval Research in September 2004 and serves as the technical director and chief scientist, reporting directly to the Chief of Naval Research (CNR). Working with the CNR, Dr. Walker is responsible for the technical content, quality of content, and structuring a science and technology (S&T) investment program that ensures technological superiority for the Navy and Marine Corps.

Dr. Walker works with the university community, government

laboratories, the military services, Office of the Secretary of Defense, and industry to bring their resources into the naval S&T program.

CHIPS asked Dr. Walker to talk about his work in August at the Naval S&T Partnership Conference.

CHIPS: How do you bring such diverse groups together to work toward one common goal?

Dr. Walker: My career started at the Naval Weapons Center at Corona Laboratories back in 1968, so I have a good understanding of naval S&T since my work started with weapons research and development (R&D) during the Vietnam War.

From those beginnings, I spent 26 years in industry, and then I returned to the Defense Department to help stand up the Defense Threat Reduction Agency as the head of science and technology. I was the senior adviser for S&T to the director of DTRA.

The universities and small businesses (*where a lot of creativity comes from*) come together with ONR in terms of discoveries, and ONR capitalizes or harnesses that S&T. We look at the S&T for naval applications and what is important for the Department of the Navy (DON) and our Sailors and Marines.

ONR's focus includes what S&T discoveries can be revolutionary and game-changing. How do we *insure* that ONR provides a leg up on the technology surprise to our warfighters?

Academia likes to help create that discovery, and we have 60 years of good experience on how to support the best and brightest people. ONR is very proud that 57 of our principal investigators across the academic institutions have won the Nobel Prize.

Our program officers and department heads are often Ph.D.s with 10 to 15 plus years experience before they come to ONR. They are well recognized either nationally or internationally in their fields. They know how to identify the best and brightest of people and how to best identify exciting areas of opportunity for discovery that would be of importance to the DON assuring

technology superiority and military capability for the fleet and force.

Having the S&T focus and talent at ONR harnesses the Naval Research Enterprise (NRE) as an engine for S&T discovery and exploitation. The NRE includes academia, industry, small business, our naval warfare centers, our military service partners, other government agencies, and our coalition partners together to catalyze S&T to empower the fleet and force.

We like to capture the S&T synergisms that are within government, in our national laboratories, and within ONR's corporate laboratory, the Naval Research Lab, as well as our University Applied Research Centers (UARC)s. The Applied Research Lab at Penn State, the Applied Physics Lab at Johns Hopkins, the Applied Research Lab at the University of Texas, and the Applied Physics Lab at the University of Washington — are all Navy UARC)s.

Each of our UARC)s helps ONR in our outreach to academia. They do both classified and unclassified work. They understand how to conduct and harvest S&T that may have naval military application. The UARC)s help us reach out across our naval warfare centers and they help us reach into industry, into application, and into programs of record.

ONR has evolved over the last 60 years from our beginnings as a basic research organization. We were the precursor to the National Science Foundation.

In 1951, *Scientific American* reported that the government was considering creating a National Science Foundation and that the template would be the Office of Naval Research because ONR was at that time the largest funding organization of basic science in the federal government, and our performance track record was exemplary.

Forty-two percent of our investment in basic research and early applied research can be found in thousands of grants with the global university community. We reach out to the entire world because we do not have a license for discovery just within the United States, and we need to be aware of important discoveries that occur outside our home borders.

CHIPS: Have we ever been surprised by something new?

Dr. Walker: Fortunately, we have stayed on top of S&T that could have strategic impact. One example is the work that Otto Hahn and Lise Meitner did in Germany. Their original scientific papers were noticed by Enrico Fermi and other U.S. scientists during World War II. Hahn and Meitner published papers that described what some interpreted as nuclear processes occurring within atoms.

Einstein's famous letter to President Roosevelt, with the support of Enrico Fermi, stated that the work by Hahn and Meitner could be far-reaching and of strategic importance to the world, a discovery that could be a new form of energy that we could harness that could also lead to a new class of weapon far surpassing anything that man had ever seen.

Discoveries occur and people do not know where it is going to lead. Many important discoveries are often serendipitous and orthogonal to where a scientist or engineer begins his research thrust. We need to be cognizant of that.

The United States has led science and technology for many years in many different fields, in collaboration with our European partners, the United Kingdom, Australia, Canada and India, for example. A lot of intellectual capability in the physical sciences and engineering has been found outside U.S. borders within the nations of the world. I am not so naive to believe that future discoveries will be limited to within our usual partners.

CHIPS: You have a diverse and impressive background in research in both government and industry including Argonne National Laboratory, Los Alamos National Laboratory, Idaho National Laboratory and Lawrence Livermore National Laboratory. What draws you to naval research and government service?

Dr. Walker: I owe a lot to the Navy. I was born into a Navy family. My dad was a Navy fighter pilot. In World War II, he flew the F4U Corsair as a carrier combat pilot. I was born at the Navy hospital in Portsmouth, Va., at the end of World War II.

My degrees are in physics. During the Vietnam War, I wanted to become a naval officer, like my dad, so I signed up for Officer Candidate School (OCS). I wanted to be either a pilot or a SEAL, but they both required perfect vision. So I decided to do whatever I could do best to serve my country and the Navy.

In parallel with that, I joined the Naval Weapons Center as a research physicist working on proximity fuses and later on guidance and warheads. My thinking was that I could continue to help support the Navy prior to my admission to OCS, which was not scheduled for many months. There was an eight-month wait.

During that time the admiral at the head of the Naval Weapons Center at China Lake convinced me that my career for the Navy might be better served if I continued working on weapons systems, air-to-air missiles and warhead development.

At that time the Naval Weapons Center was doing a lot of countermeasure work to address the ongoing threat in Vietnam. We were sending a lot of our folks to Vietnam as scientists and engineers so we could work side-by-side with our warfighters to figure out how to defeat the booby traps and mines that were killing them and affecting our riverine operations.

From this focus, the admiral advised me that if I stayed on as a civilian at the Naval Weapons Center, I could get a change of workweek and go to graduate school in physics and work full-time too. I took his offer and began full graduate school loads at the University of California and worked full-time.

Needless to say this schedule just about killed me, but then my department head told me about a Naval Fellowship Program to the University of California. He recommended that I compete for the fellowship. I took the exams and the oral boards, and I

was selected. My duty station became the University of California from the Naval Weapons Center, and I finished my doctorate in nuclear physics there.

The Navy helped me do all that.

When I first came aboard to DTRA, the director was Dr. Jay Davis. For the previous six years, I had been a science adviser to Lawrence Livermore National Laboratory, which is operated by the University of California for the U.S. Department of Energy. I came aboard as a member of the Senior Executive Service and served as the senior adviser for S&T at DTRA.

In this capacity I served as a member of the Defense Science and Technology Advisory Group with Dr. Hans Mark, Director Defense Research and Engineering (DDR&E) in the Office of the Secretary of Defense in 2000 and with Dr. Delores Etter, who was the deputy under secretary of Defense for S&T, under Dr. Mark.

I worked closely with Rear Adm. Paul Gaffney while he was the CNR from 1996 to 2000 and then with Rear Adm. Jay M. Cohen, when he came aboard as the CNR.

During this same period I was asked by DDR&E to serve as the technical program officer for the DoD to lead advanced energetics for the Department and to lead the thermobaric weapon development (BLU-118) and Hellfire II.

After the horrific 9/11 attacks on the United States, I worked closely with ONR with the outstanding help of Dr. Ed Liszka (Dr. Liszka was ONR's chief scientist and is now the director at ARL Penn State) and Dr. Spiro Lekoudis (an ONR department head), with the Naval Surface Warfare Center Indian Head Division and the U.K. Ministry of Defense, so that we could develop a thermobaric weapon in 90 days that we would then use to defeat our adversaries within the Afghanistan caves.

These great experiences and support with and from the Navy gave me the opportunity to tell Rear Adm. Cohen that it would be a pleasure to come back and be part of the DON team.

From my perspective, I wanted an opportunity to help the DON and to give back whatever I could best contribute in supporting our Sailors and Marines and to help build the capabilities of the fleet and force.

CHIPS: You mentioned the Nobel laureates that have been funded by ONR. What draws such a large distinguished group to national defense, particularly the Navy?

Dr. Walker: If you look at the history of the ONR and the foundation of the Naval Research Lab, NRL is ONR's corporate laboratory. The need for NRL was first conceived by Thomas Edison and other leaders about 1917 after the sinking of the Lusitania.

The United States realized that we were being surprised technologically with the capabilities of the German submarine force, and we needed a great laboratory for the U.S. to ensure that the U.S. always would have technology superiority.

"I want a 'Tricorder' for evil. I would like to be able to detect intent. You have to understand how a person is motivated. Why would he or she want to become a terrorist?"

– Dr. Starnes Walker

Thomas Edison and Vannevar Bush, with the support of the Navy Department, championed the creation of NRL with Congress. About 1920, construction on the site started and thus began the genesis of NRL. NRL has a history of attracting the brightest of scholars together for naval S&T.

I do not know the exact number of how many Society Fellows we have in all of the nation's professional societies, but I am sure it is hundreds. NRL has a Nobel laureate in chemistry, a Fields Medal winner, and nine National Academy members. For almost 90 years since its founding, NRL has been the residence of the best and brightest of scholars.

CHIPS: Do you have a particular area of research or project that you are most interested in?

Dr. Walker: From the DON standpoint, the things that intrigue me are enhancing our strike capability and as a subset, directed energy and the ability to reach out and hold at risk at the speed-of-light, or near speed-of-light, advanced weapon capability.

In the area of material science, if we can push the frontiers of science to achieve room temperature superconductors, that would be game-changing. The impact of room temperature superconductors would cut across many fields — from propulsion to motor generators, how we apply that to the production of electricity, how this would impact energy efficiency and magnetic energy storage. It would revolutionize our capability and touch many facets of society.

The area of energetics intrigues me. We have been working with the same chemistries for 40 or 50 years. What new mechanisms exist to store energy and release it rapidly? Can we develop areas of designer molecules and designer crystalline structures that can store significant amounts of energy? The area of energy and power is important. From a DON standpoint, without energy and power, we are literally and figuratively dead in the water.

Oil is now \$75 a barrel. Where is it going to? Energy security is related to national security.

CHIPS: You have engaged the scientific community concerning the improvised explosive device problem. Is progress being made?

Dr. Walker: I believe we are making progress, but we have a long way to go. We are trying to save the lives of our warfighters, but the IED is also a threat to the nations and people of the world. Solutions to the IED threat are going to require us to move up the kill chain so that we can move miles and days spatially and temporally away from the 'boom' so that we can strike and de-

feat the terrorist and his IED before we are in harm's way. We need to work on the prediction side of the equation.

If we can achieve this, we can hold at risk the bomb maker and the people providing the ingredients and the funding and their will. Like the drug trade, the analogy is that you have to have seeds to grow, you have to harvest your product, you have to process, you have to package, you have to distribute, and you have to have the economics that support this infrastructure.

The solution is going to be interdisciplinary. Many discoveries in science are serendipitous. You start out in one direction, but the real discovery is after you see something that you do not understand. Then you move in another direction, an area that is most fertile, and that is where you make a game-changing discovery.

When you build an interdisciplinary community of the human behavioral, social and cultural sciences and religious studies, those scholars working with physical scientists and people that have not worked together sometimes spawns creativity.

When you bring principal investigators that have different fields of expertise, different views, and a different experience base, that is where the art of the possible happens.

CHIPS: I've read about studies that look at affecting a cultural change, so that the action would be so reprehensible that making or planting an IED would be unthinkable.

Dr. Walker: What makes terrorists stand out within their own tribe — within their own religious sect — within their own close community?

I want a 'Tricorder' for evil. I would like to be able to detect intent. You have to understand how a person is motivated. Why would he or she want to become a terrorist? That is all tied into that linkage of tribal, cultural, social-economic and religious dynamics. How do those play together so that a person would want to become a terrorist and suicide bomber?

CHIPS: Are poverty and education factors?

Dr. Walker: There are many factors and I do not think any one thing derives it. If we could, we would be closer to the solutions. I do not think we have enough knowledge yet to firmly say the solution is close at hand. In science we call it degrees of freedom or hidden variables.

What drives behavior? Many things interplay with one another. It is a dynamic thing. We need to understand how it fits together.

There may be a way to affect future behavior in a way that terrorists and their close-knit sect would say, 'There is a better way. Violence is not the answer.'

To read about the ONR supported Nobel laureates, go to <http://www.onr.navy.mil/about/nobels>. Please go to the ONR Web site at http://www.onr.navy.mil/about/docs/walker_starnes_2006.pdf for Dr. Walker's biography.

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